

Figure S1. System diagram of test devices

1.Inlet tank 2.Experimental pump device and drive motor 3.Pressure outlet tank 4.Bifurcation tank 5.Regulating gate valve 6.Stabilizing rectifier cylinder 7. Electromagnetic flowmeter 8.System forward and reverse operation control gate valve 9.Auxiliary pump unit.



(a)



(b)



(c)

(a) Impeller (b) Guide vane (c) Vertical axial flow pump device

Figure S2. Hydraulic model of axial flow pump and vertical axial flow pump device

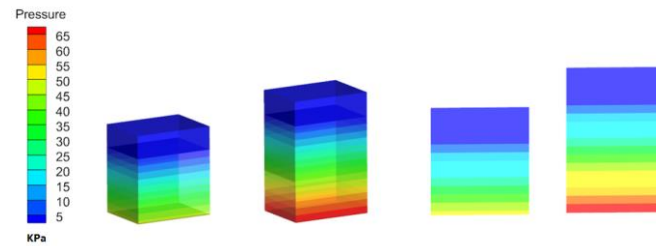


Figure S3. The static pressure distribution at the inlet boundary (left) and outlet boundary (right)

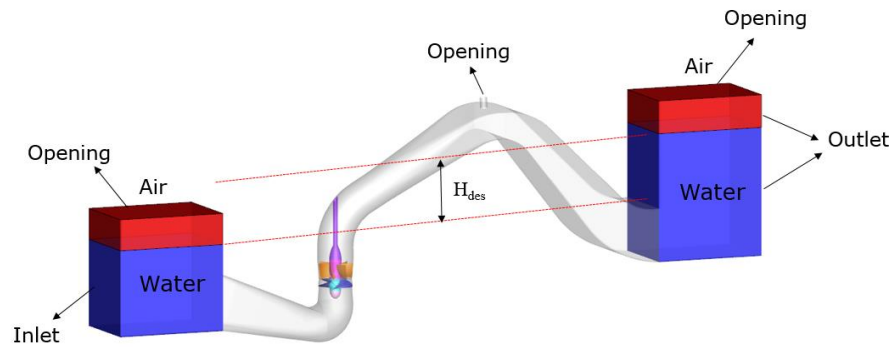


Figure S4. Calculation domain in Case 2.

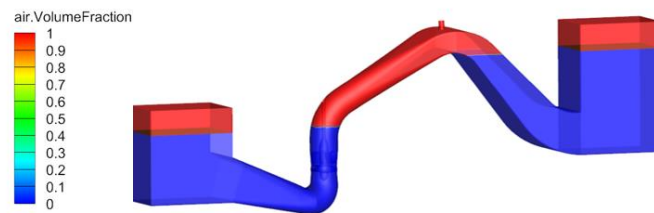


Figure S5. Initial conditions for the volume fraction of air and water

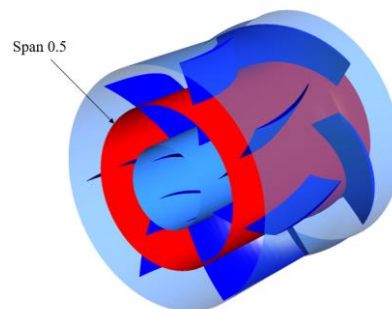


Figure S6. Schematic diagram of the position of the mid-span section